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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/637,639	08/11/2003	John Grace	M596 0006	3365

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EXAMINER	
WARTALOWICZ, PAUL A	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/637,639	GRACE ET AL.	
	Examiner	Art Unit	
	Paul A. Wartalowicz	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/11/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-12, drawn to a method, classified in class 423, subclass 650.

II. Claims 13-20, drawn to an apparatus, classified in class 422, subclass 147.

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process, such as a method without directing resultant oxidized gases and particulate catalyst to the first endothermic dehydrogenation reaction mode.

During a telephone conversation with Gerald Oyen on October 20, 2005 a provisional election was made with traverse to prosecute the invention of the method, claims 1-12. Affirmation of this election must be made by applicant in replying to this Office action. Claims 13-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roy et al. (U.S. 6331283) in view of Leffer (U.S. 2698281).

Roy et al. teach a method of producing hydrogen gas from a hydrocarbon gas and steam comprising forming a fluidized bed of a suitable particulate catalyst in a reactor (fig 1, #20) wherein the catalyst is disposed in the reactor in two reaction modes, the first being an endothermic dehydrogenation (col. 4, lines 16-33) and the second being an exothermic oxidation of partial oxidation reaction mode (col. 4, lines 16-33), introducing a mixture of steam and hydrocarbon gas into the bottom of the fluidized bed to fluidize the particulate catalyst and form the fluidized bed (fig 1, #14a, 14b), reacting the steam and hydrocarbon gas within the first endothermic dehydrogenation reaction mode to produce hydrogen gas (col. 4, lines 16-33), separating said hydrogen gas from other gases in the first endothermic dehydrogenation reaction mode as molecular or atomic hydrogen through a vertical perm-selective membrane that permits the transfer of hydrogen therethrough while minimizing the transmission therethrough of the other gases in the endothermic dehydrogenation reaction mode (fig 1, #18; col. 4, lines 33-35), introducing oxidant in the second exothermic oxidation or partial oxidation reaction mode (fig 1, #16), and mixing same with other gases in the second exothermic oxidation and partial oxidation mode. Roy et al. fail to teach the directing resultant oxidized gases and particulate catalyst to the first endothermic dehydrogenation.

Leffer, however, teaches that the process flow leads up the ascending fluidized annular column with the exothermic reactions to the inner reaction zone with the dehydrogenation reactions (col. 3, lines 9-20) for the purpose of balancing the temperature within the inner reaction zone with the temperature at which the exothermic reaction is completed in the ascending fluidized annular column (col. 3, lines 6-10).

Therefore, it would have been obvious to one of ordinary skill in the art to have provided the ascending fluidized annular column with the exothermic reactions to the inner reaction zone with the dehydrogenation reactions (col. 3, lines 9-20) in order to balance the temperature within the inner reaction zone with the temperature at which the exothermic reaction is completed in the ascending fluidized annular column (col. 3, lines 6-10) in a known reaction of hydrocarbon conversion.

As to the limitations of claims 2, 4, 6, and 12, Roy et al. fail to teach a method wherein the first endothermic dehydrogenation mode and the second exothermic oxidation or partial oxidation mode are separated by a barrier method wherein gases circulate upwards through the first endothermic dehydrogenation mode and downwards through the second oxidation or partial oxidation mode, and wherein the the particulate catalyst circulates downwards through the first endothermic dehydrogenation mode which contains vertically disposed per-selective membrane surfaces and upwards through the second oxidation or partial oxidation mode wherein the particulate catalyst is separated from the other gases before they are conveyed from the process wherein the particulate catalyst circulation rate is controlled by supplementary aeration or fluidizing gas introduced through gas distributors or nozzles.

Leffer, however, teaches a fluidized bed reactor in which gases circulate downward through the first endothermic dehydrogenation mode and upward through the second oxidation or partial oxidation mode (fig, #10,13) and separated by a barrier (fig, #10) for the purpose of balancing the temperature of the inner reaction zone with the exothermic reaction temperature (col. 3, lines 8-12).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to have provided a fluidized bed reactor in which gases circulate downward through the first endothermic dehydrogenation mode and upward through the second oxidation or partial oxidation mode (fig, #10,13) in the method for conversion of hydrocarbons of Roy et al. for the purpose of balancing the temperature of the inner reaction zone with the exothermic reaction temperature (col. 3, lines 8-12) as taught by Leffer. Leffer also teaches that solid particles may be readily fluidized and transported from one zone to another and flow readily with little or no clogging, and have a minimum tendency of undergoing attrition (col. 3, lines 35-41). Therefore, it would have been obvious to provide catalyst particles that can be fluidized and transported from one zone to another and have a minimum tendency to undergo attrition in order to transport and separate catalyst particles in the similar hydrocarbon conversion method of Roy et al. as taught by Leffer.

As to claims 8, 9, and 10, Roy et al. teach a method wherein the oxidant is provided in a solids downflow that surrounds the first dehydrogenation reaction mode (fig 1, #14a, 14b, 16, 20) and an oxidant that is oxygen (col. 4, line 33) and a sweep gas used to increase hydrogen permeation as a result of the partial pressure of hydrogen on the membrane side (col. 6, lines 26-32).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roy et al. (U.S. 6331283) in view of Leffer (U.S. 2698281) and Nataraj et al. (U.S. 6110979).

Roy et al. teach a method for converting hydrocarbons as described above. Roy et al. fail to teach wherein gases circulate upwards through the first endothermic dehydrogenation mode and downwards through the second oxidation or partial oxidation mode.

Nataraj et al., however, teach a method for the conversion of hydrocarbons wherein the gases move upward through the endothermic dehydrogenation mode (fig. 2, #5,7,201) and downwards through the second oxidation or partial oxidation mode (fig. 2, #207,209,47). Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to have provided a method for the conversion of hydrocarbons wherein the gases move upward through the endothermic dehydrogenation mode (fig. 2, #5,7,201) and downwards through the second oxidation or partial oxidation mode (fig. 2, #207,209,47) in order to produce an intermediate feed stream containing methane, hydrogen, carbon dioxides, and steam which can be processed in an oxidation step (oxidation occurs in the membrane reactor, col. 9, lines 52-59).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roy et al. (U.S. 6331283) in view of Leffer (U.S. 2698281) and Nataraj et al. (U.S. 6110979) and Ruotto et al. (U.S. 6045688).

Roy et al. teach a method for converting hydrocarbons as described above. Roy et al. fail to teach wherein the oxidant is provided in a mixing zone above the surface of the membrane and the barrier.

Ruotto et al., however, teach oxygen containing gas flow provided for in the regenerator cyclone (fig 1, #25) above the regeneration chamber (fig 1, #26) for the purpose of oxidizing coke possibly accumulated on the surface of the solids and organic compounds penetrated in the pores thereof (col. 9, lines 50-57). Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was invented to have provided an oxygen containing gas flow provided for in the regenerator cyclone (fig 1, #25) above the regeneration chamber (fig 1, #26) in Roy et al. in order to oxidize coke possibly accumulated on the surface of the solids and organic compounds penetrated in the pores thereof (col. 9, lines 50-57) as taught by Ruotto et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul A. Wartalowicz whose telephone number is (571) 272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Paul Wartalowicz
October 25, 2005

COLLEEN P. COOKE
PRIMARY EXAMINER